UNITED STATES PATENT OFFICE.

FRANK J. TONE, OF NIAGARA FALLS, NEW YORK, ASSIGNOR TO THE CARBORUNDUM COMPANY, OF NIAGARA FALLS, NEW YORK, A CORPORATION OF PENNSYLVANIA.

REFRACTORY MATERIAL.

1,042,844. Specification of Letters Patent. Patented Oct. 29, 1912.

No Drawing. Application filed April 25, 1905. Serial No. 257,319.

To all whom it may concern:

Be it known that I, FRANK J. TONE, of Niagara Falls, Niagara county, New York, have invented a new and useful Improvement in Refractory Materials, of which the following is a full, clear, and exact description.

This invention relates to the use of carborundum as a refractory material, and especially refers to a method of using the same as a solid lining material for furnaces.

My invention will be best understood by describing its application in the construction of a tilting melting furnace such as is commonly used in the melting of brass, and heated by oil or gas. Such a furnace consists of an iron or steel shell lined on the interior with refractory material. The lining has commonly been made of fire brick of such special shapes as will exactly fit the shell and give the proper shape for the interior melting chamber. It has been found advantageous to make this in the form of a solid molded lining mainly composed of carborundum, and my invention especially refers to the composition of the materials composing the lining which will meet the special requirements of this work. When carborundum is used for this purpose it must be mixed with a suitable binder, and pressed and rammed into place in the shell. It must then be dried out and fired. As one side of the lining is in contact with or in close proximity to the steel shell of the furnace, it cannot be highly heated at this point without fusing the iron; the interior on the other hand must be brought up to the high temperature of the oil flame. In order to exert proper binding action under these extreme conditions of temperature, the binder used must possess peculiar properties, and therefore, I propose to have the refractory material include a bond which is most effective at a high temperature so as to prevent disintegration of the inner portion of the refractory lining which is directly exposed to the heat of the furnace, and another bond which is most effective at a relatively low temperature, so as to prevent disintegration of the outer surface of the refractory lining. While the bond which is most effective at a relatively low temperature may become destroyed in the highly heated portions of the lining, it becomes a flux when highly heated and unites with the other bond, which materially increases the binding power of the latter. It is therefore apparent that, while the two bonds are designed to respectively meet the conditions of the lining at its inner face and at its outer face, they are also designed to combine and increase the efficiency of the bond which is primarily designed for meeting the conditions at the inner surface of the lining. I have discovered that a mixture of carborundum, fire clay and silicate of soda of proper proportions, meets the conditions in a satisfactory manner. Silicate of soda is a binder which possesses considerable binding properties when merely dried out in the air; when heated to from 400° to 600° Fahr., its full binding property is developed; when heated to white heat, its chemical composition changes and its binding power may in cases be destroyed. For this reason, the addition of fire clay is found advantageous, its binding power being only fully developed at white heat and the soda from the decomposed silicate acting as a flux to fuse the clay. The grades of silicate of soda which I have found most suitable for this work are from 47° to 50° Baumé. The presence of the clay in the cooler portions of the lining does not detract from the binding properties of the silicate of soda, and in the hotter portions of the lining the bond is due to the clay fluxed in a certain measure by the soda. The mixture of these two binding materials therefore provides a bond which is satisfactory for a wide range of temperature.

It will of course be understood that the present invention is of plastic material capable of being handled by means of a trowel or the like and thereby conveniently applied to the interior of the furnace and molded therein to assume the desired shape.

The carborundum employed may be amorphous carborundum (sometimes known as siloxicon or white-stuff), or crystalline carborundum may be used.

In the practice of my invention I may use the ingredients in various proportions as determined by the thickness of the lining and the limiting temperatures. I have obtained good results by a mixture consisting of 80 parts carborundum, 10 parts fire clay, and 10 parts silicate of soda; and I deem these to be the preferable proportions. I

have found that mixtures containing more than 15 per cent. of silicate of soda are too fusible to withstand furnace temperature used with lining, such as contemplated by my invention.

I claim:—

1. A plastic refractory furnace lining, including silicon carbid, fire clay and silicate of soda, the silicon carbid constituting not less than fifty per cent. of the lining, and the silicate of soda constituting not more than fifteen per cent. of the lining the mixture forming a self sustaining refractory compound; substantially as described.

2. A plastic refractory furnace lining, including carborundum as the major portion thereof, a bond which is relatively more effective at a relatively high temperature, and another bond which is most effective at a relatively low temperature, the latter bond being present in a proportion of not over fifteen per cent. of the lining the mixture forming a self sustaining refractory compound; substantially as described.

3. A plastic refractory furnace lining, including carborundum as the major portion thereof, a bond which is most effective at a relatively high temperature, and another bond consisting of silicate of soda comprising not over fifteen per cent. of the lining the mixture forming a self-sustaining refractory compound; substantially as described.

4. As a new composition of matter, a self-sustaining plastic refractory furnace lining material, composed of eighty parts carborundum, ten parts fire clay, and ten parts silicate of soda; substantially as described.

In testimony whereof, I have hereunto set my hand.

FRANK J. TONE.

Witnesses:

ASHMEAD G. RODGERS,

FRANK L. BUELL.